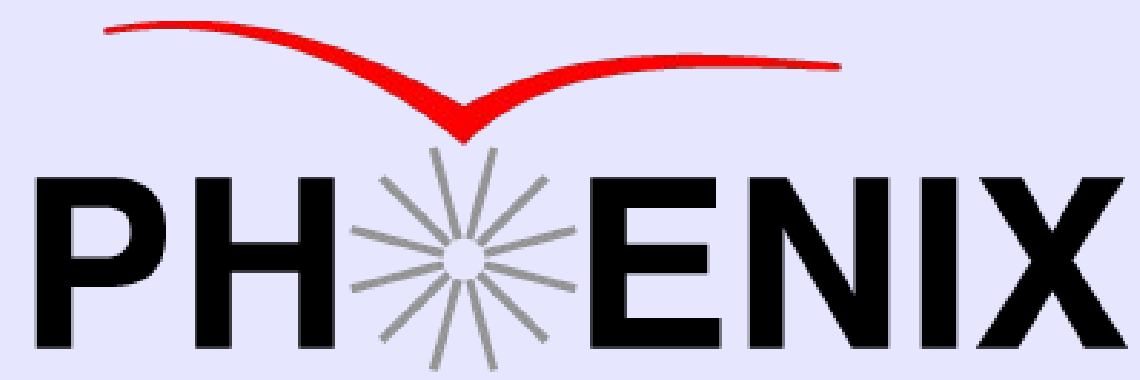


Ψ' to J/Ψ Ratio Measurements in PHENIX at RHIC



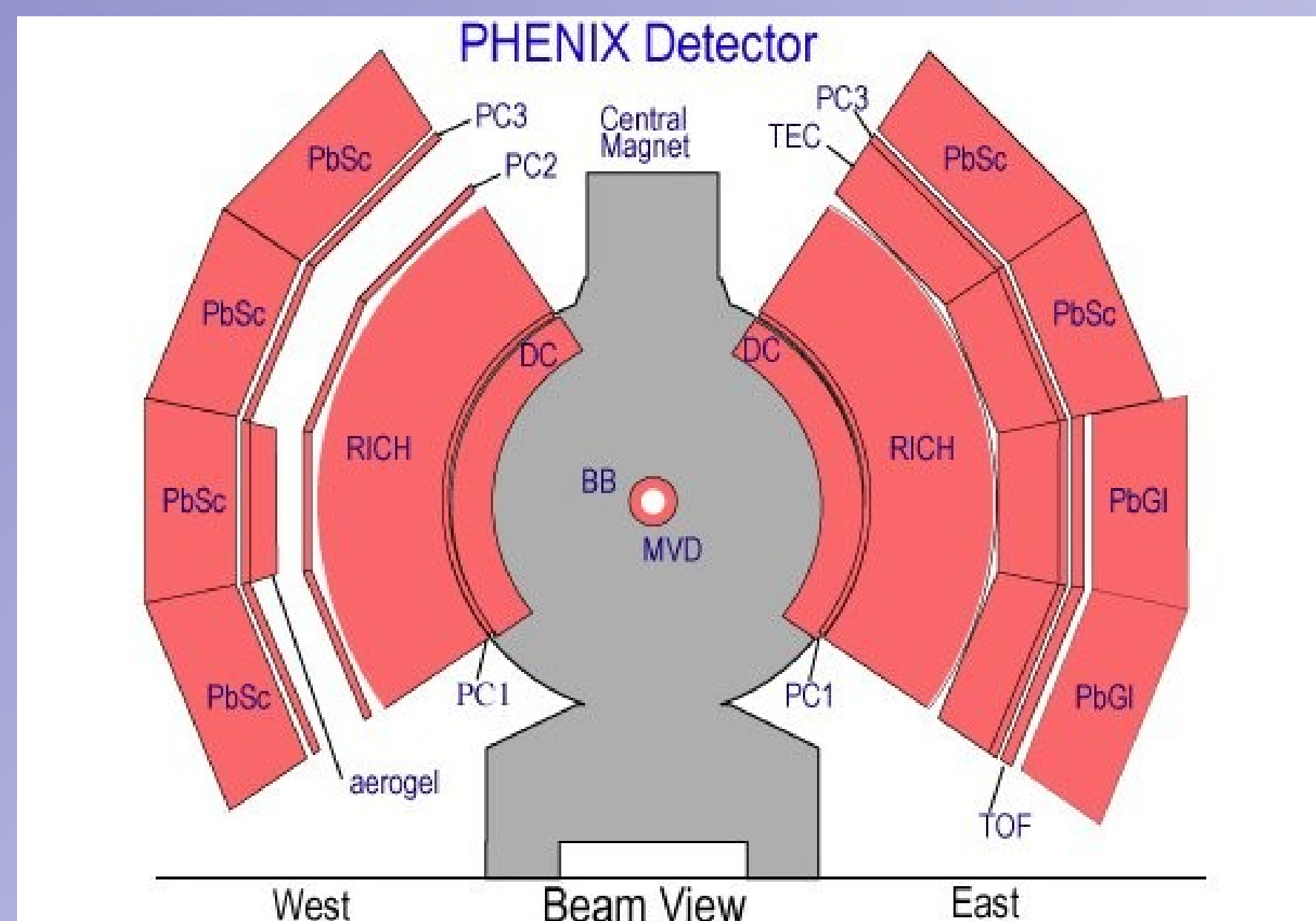
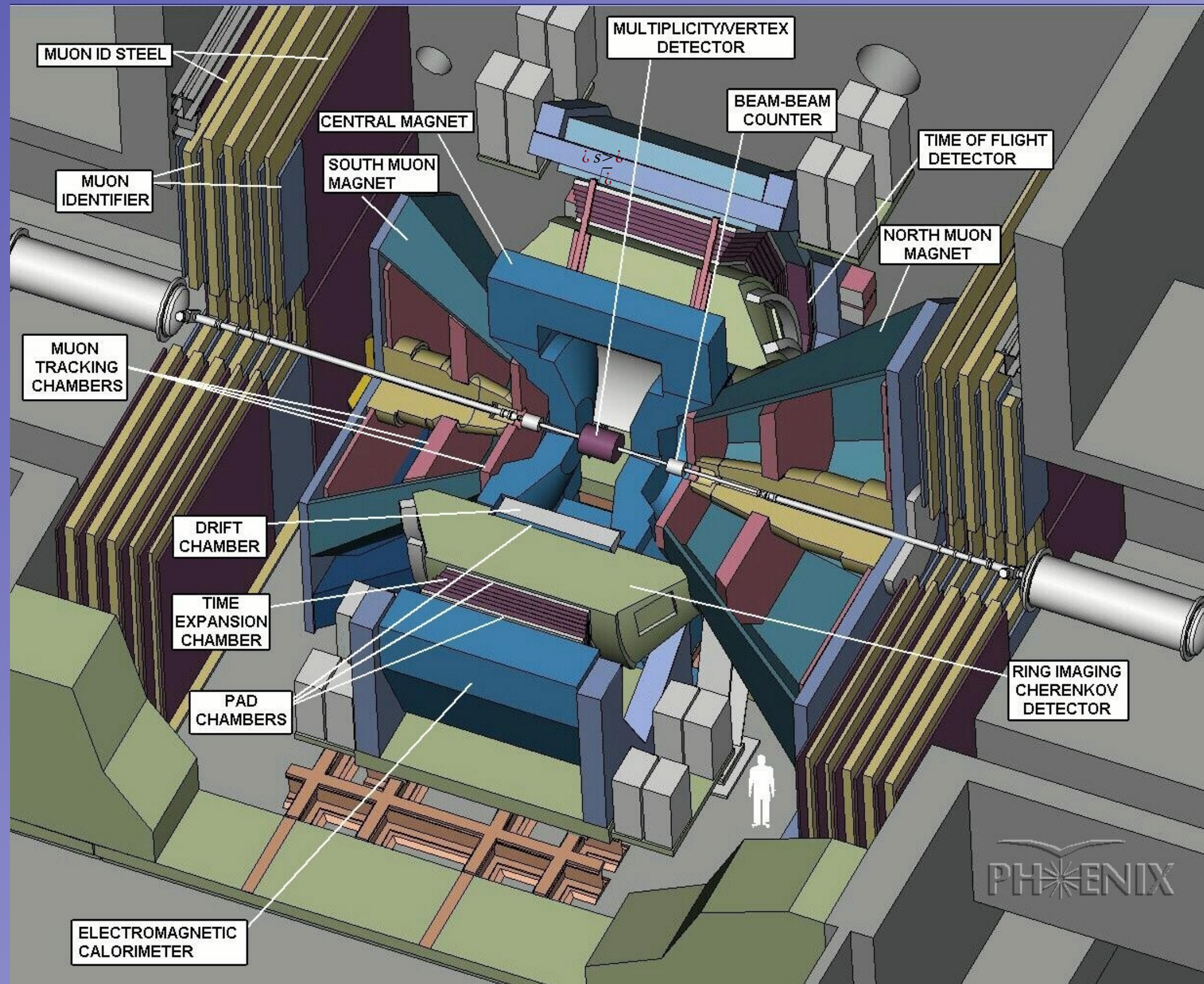
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For the PHENIX Collaboration



Introduction

The Ψ' to the J/Ψ production ratio in the dielectron channel has been measured at $\sqrt{s}=200$ GeV p+p interactions with PHENIX detector at RHIC. The measurement of the Ψ' and J/Ψ states covered a rapidity range of $|y|<0.35$ (central arms) and transverse momentum range of $0.2<p_T<5.5$ GeV/c. This measurement may help constrain production models.

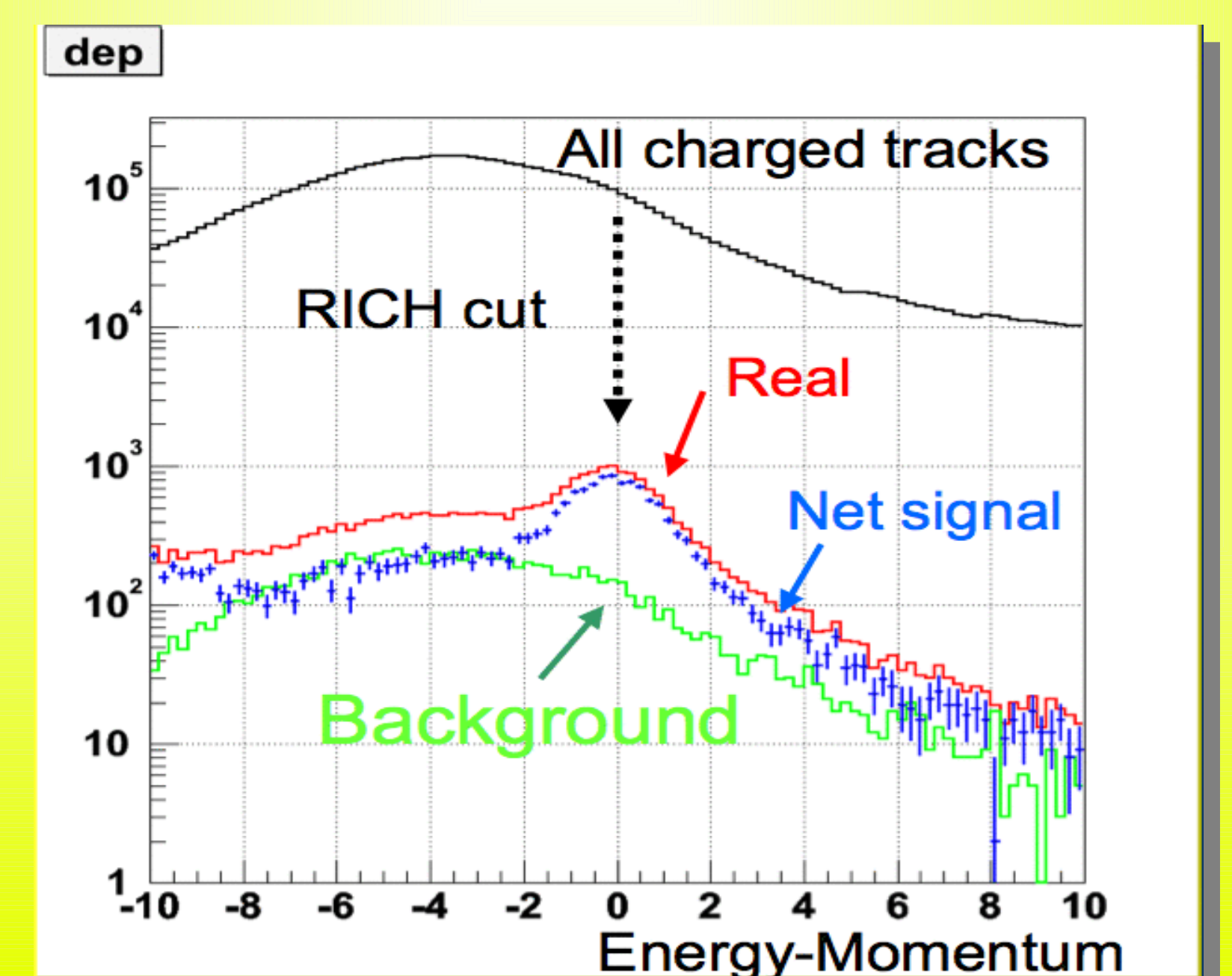
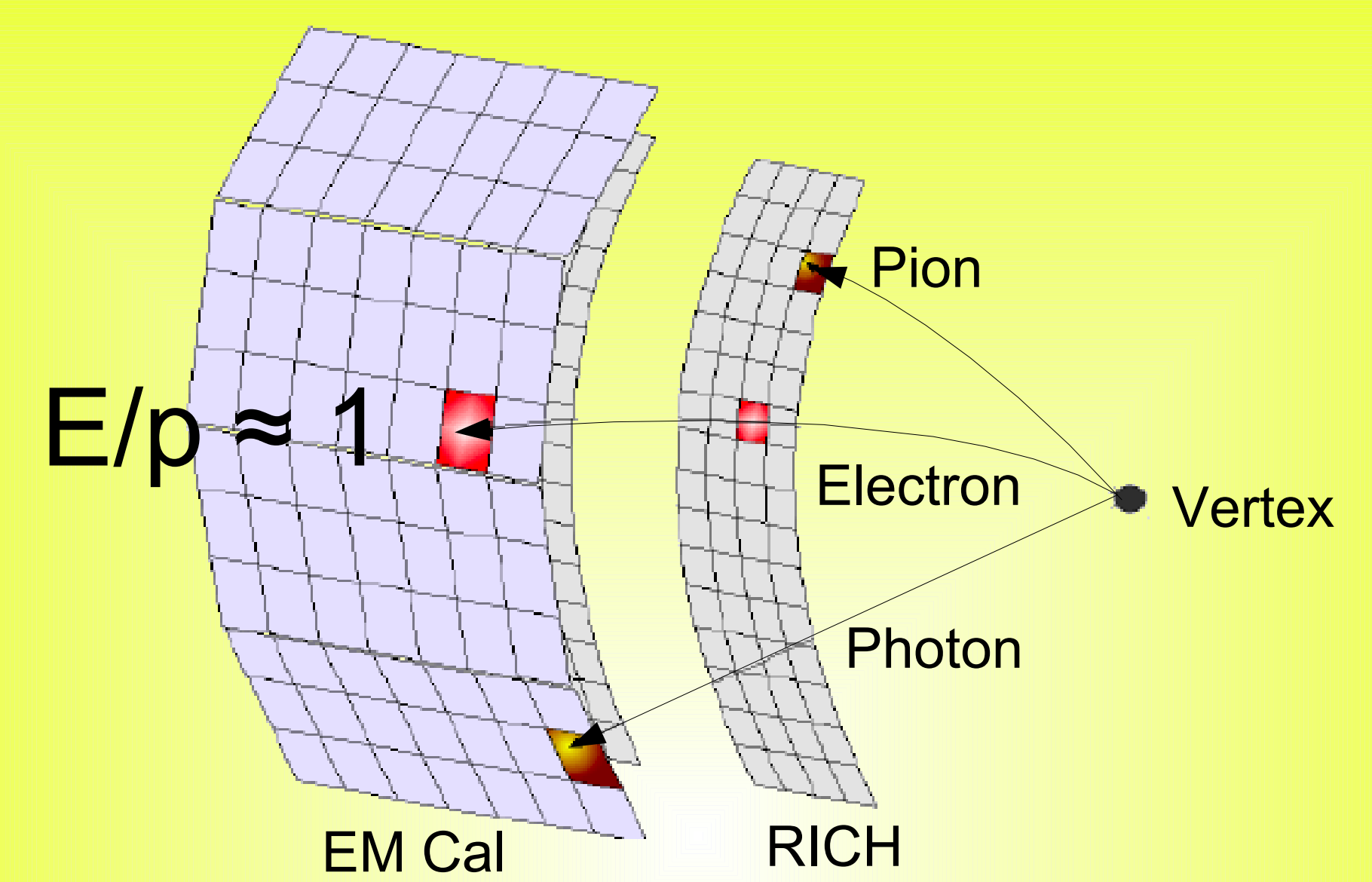
Detector System



- Capacity to measure:
 - Hadrons, Muons, Electrons, Photons

- Centrality measurement:
 - Beam Beam Counter
 - Zero Degree Calorimeter
- Momentum measurement:
 - Drift Chambers
 - Pad Chambers
 - Time Expansion Chambers

Electron Identification



Analysis Strategy

- Good capacity to trigger on lepton signals;
- Calibration and selection optimization of the electron identification;
- Physical background: pairs of leptonic decays of J/Ψ , Ψ' and continuum;
- Invariant mass spectra for electron-positron pairs;
- Combinatorial background subtraction using same sign pairs from the same event as the sum of the like sign pairs (e^+e^+)+(e⁻e⁻);
- Combinatorial background subtracted plots fitted with three different methods;
- Geant based PHENIX Monte Carlo tuning;
- Estimation of acceptance and reconstruction efficiency by checking the response of PHENIX Monte Carlo to simulated J/Ψ and Ψ' particles with rapidity in $|y|<0.35$.

Systematics Check

- Fit strategy:
 - Powerlaw (for physical background) + double gaussian (for J/Ψ) + double gaussian (for Ψ')
 - Fix (J/Ψ - Ψ') mass difference with PDG value.
 - Use same widths for J/Ψ and Ψ' distributions

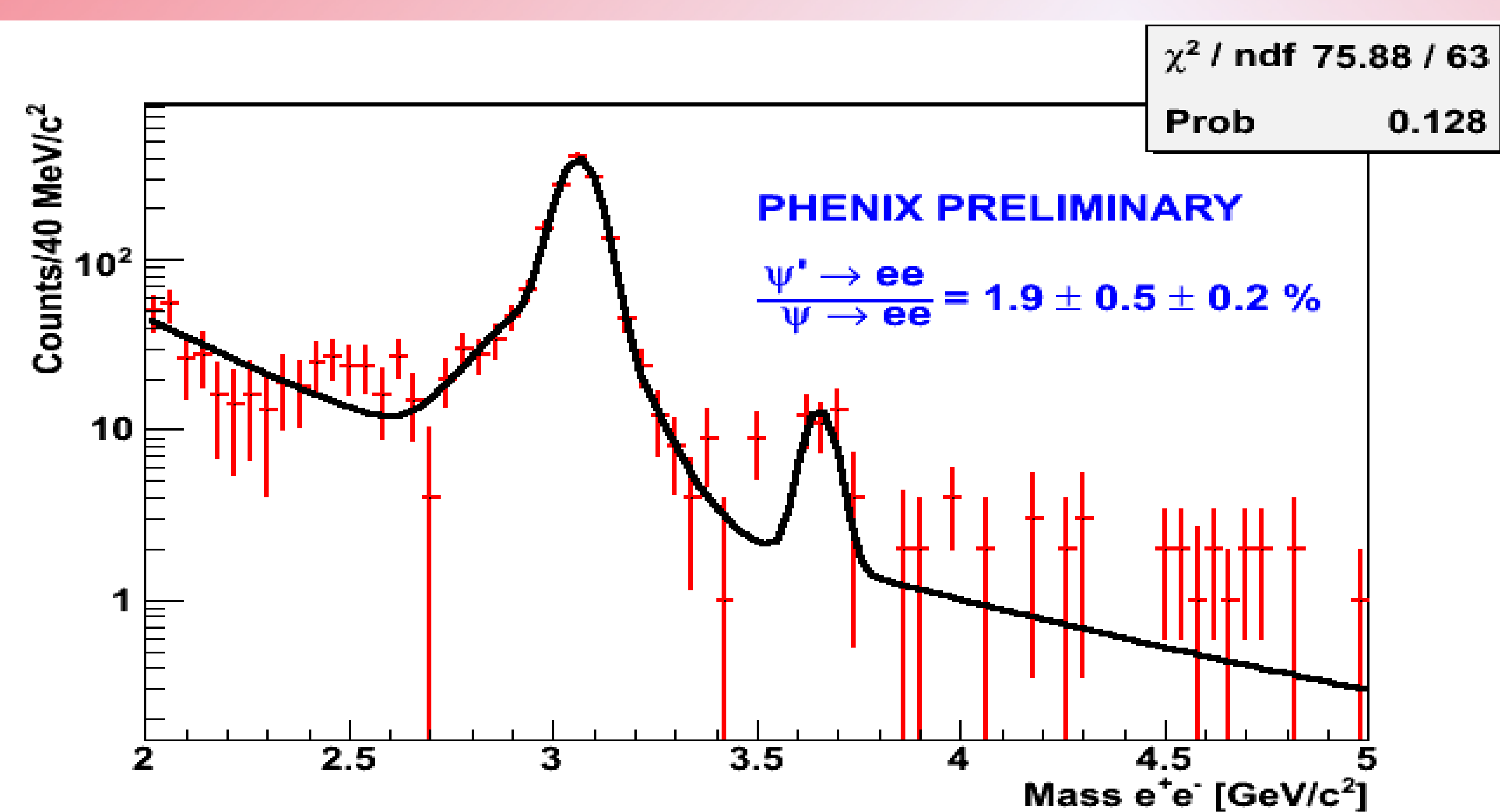
Final Results

- Fit strategy:
 - Powerlaw (for physical background) + double gaussian (for J/Ψ) + single gaussian (for Ψ')
 - Fix (J/Ψ - Ψ') mass difference with PDG value
 - Let the J/Ψ and Ψ' widths vary independently.

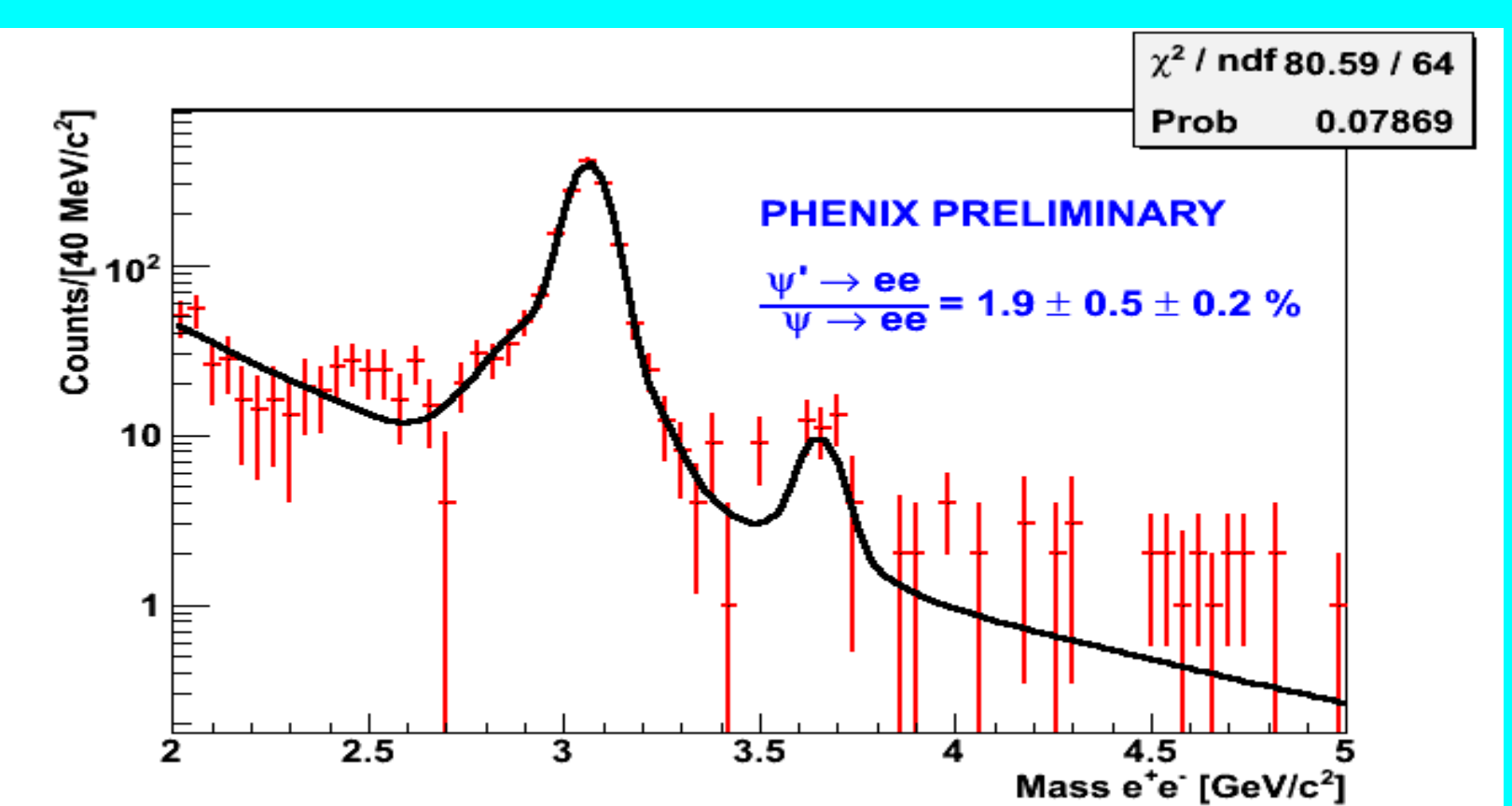
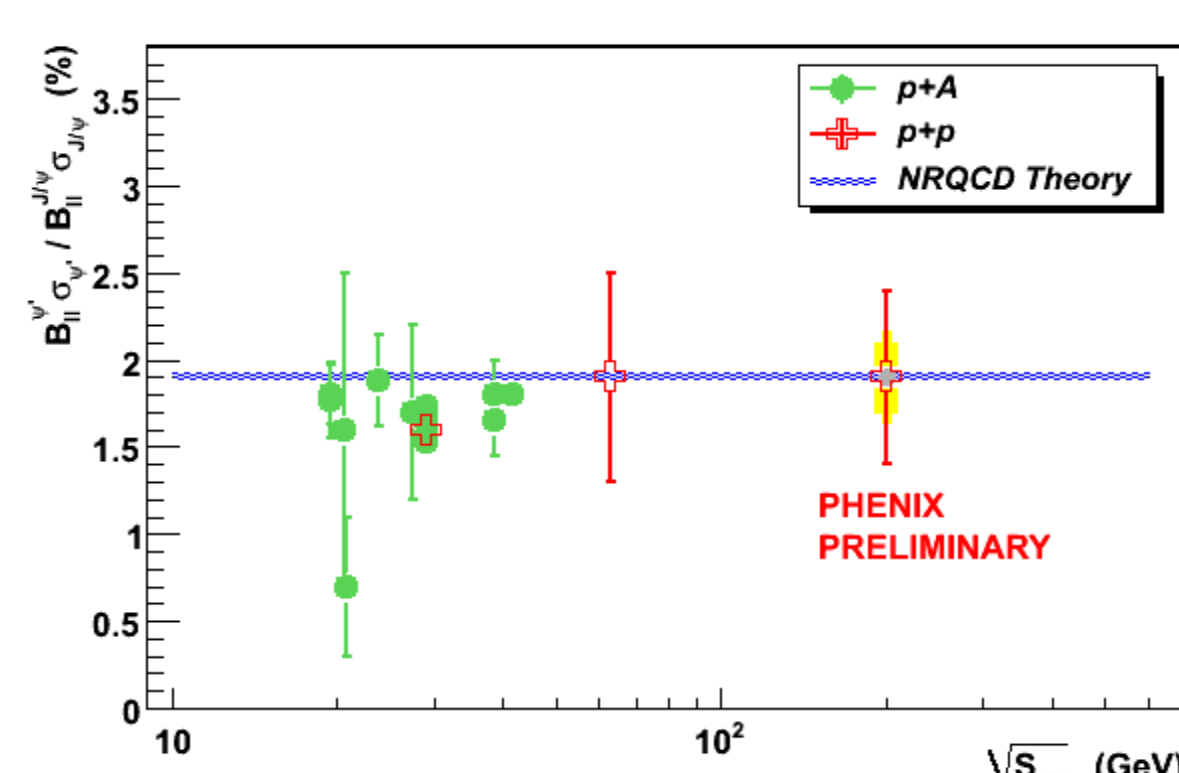
- The ratio of Ψ' and J/Ψ cross sections In the e^+e^- channel, $R_{\Psi'}(e)$ is equal to:

$$R_{\Psi'}(e) = \frac{B' \cdot \sigma'}{B \cdot \sigma} = \frac{N_{\Psi'}}{N_{J/\Psi}} \cdot \frac{\epsilon}{\epsilon'}$$

$$R_{\Psi'} = 0.019 \pm 0.005 \text{ (stat)} \pm 0.002 \text{ (sys)}$$



$B_{\Psi'}^{\Psi'} \sigma_{\Psi'} / B_{J/\Psi}^{\Psi'} \sigma_{J/\Psi}$ ratio as a function of the energy in the center of mass frame measured in various experiments



- Fit strategy:
 - Exponential (for physical background) + double gaussian (for J/Ψ) + single gaussian (for Ψ')
 - Fix (J/Ψ - Ψ') mass difference with PDG value
 - Let the J/Ψ and Ψ' widths vary independently.

